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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
DAGER, JONATHAN M	
ART UNIT	PAPER NUMBER
3663	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/573,410	BITAR ET AL.	
	Examiner	Art Unit	
	Jonathan M. Dager	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 March 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 March 2006* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *27 March 2006*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

The claims are objected to because the lines are crowded too closely together, making reading difficult. Substitute claims with lines one and one-half or double spaced on good quality paper are required. See 37 CFR 1.52(b).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 6-9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishihara et al. (US 6,707,394) in view of Eppler (US 6,084,989).

Regarding claims 1, 6-9, and 11, Ishihara discloses a device in which for generating a terrain clearance floor envelope for use in a ground proximity warning system. In one embodiment, the present invention includes a processor that defines a terrain clearance floor envelope having at least two boundaries. In this embodiment, the processor defines at least one of the boundaries based on a runway position quality factor, an altitude data quality factor, and an aircraft position quality factor (abstract).

Further, Ishihara discloses that terrain and obstacles that pierce the terrain caution and warning envelopes are displayed to the flight crew as potential ground proximity problems by appropriate alarms or warnings. Further, and importantly, the

ground proximity warning system also generates terrain clearance floor envelopes that provide minimum altitudes that the aircraft should maintain above terrain underlying the aircraft. If the altitude of the aircraft, with respect to the underlying terrain, is less than the minimum altitude required by the terrain clearance floor envelope, the ground proximity warning system will provide appropriate alerts.

Lastly, Ishihara discloses that the determination of the location of the inner boundary of the envelope is typically based on the coordinate position of the selected runway and the coordinate position and altitude of the aircraft.

Ishihara provides an invention that predicts the flight envelope of an aircraft, and provides terrain avoidance information in part due to information fro the terrain database and aircraft flight information.

Ishihara does not explicitly disclose using distance transfoms on displayed terrain images.

Eppler, however, teaches a system and method for determining offset errors between line and pixel coordinates of landmarks in a digitized image generated by an imaging system disposed on a spacecraft and line and pixel coordinates predicted by a mathematical model of the imaging system using landmark geodetic coordinates on the Earth. The system and method use landmarks in symbolic form, such as perimeters of lakes and islands that are stored in a database. A digitized image generated by the satellite-based imaging system is processed to extract a patch of the image containing a landmark. The image patch is then upsampled (magnified). The landmark boundary is processed using a mathematical model of the imaging system to generate absolute

coordinates of the boundary pixels, which are upsampled and rasterized to produce a landmark mask. The landmark mask and the upsampled image patch are then processed by one or more matching algorithms to generate line and pixel offset error values indicative of the offset between the predicted position of the landmark and the actual position of the landmark in the image. A match figure of merit is also generated that is indicative of the reliability and accuracy of the computed offset. Optionally, the upsampled image patch is processed using an image enhancement algorithm that increases the contrast and robustness of the images by converting pixel gray scale values into likelihood ratios (abstract).

It is also noted that Eppler discloses that the edge matching algorithm achieves location accuracy by matching a large number of edge points in the image to the projected landmark perimeter. The edges are detected using a Laplacian-of-Gaussian algorithm given in a paper by D. Marr et al., "Theory of Edge Detection", Proc. Roy. Soc. Lon. B., vol. 207, 1980, p. 187-217. These edges result from both the landmark and clouds. The edge matching is carried out by blurring the edges using a nearest edge transform described in a paper by G. Borgefors, "Distance TRansformations in Digital Images", Comput. Vision Graphics Image Process., vol. 34, 1986, p. 334-371 and D. Paglieroni, entitled "A Unified Distance TRansform Algorithm and Architecture", Mach. Vision Appl., vol. 5, 1992, p. 47-55 to form the image D(c,r); the value D at any pixel (c,r) represents the distance from that pixel to the nearest edge pixel. This approach is relatively insensitive to variations in gray-scale intensity and cloud cover anywhere in the image patch.

The system and method of Eppler uses geodetic information obtained from a terrestrial database to provide distance and image information using among others, the works of Borgefors.

The Applicant has provided in the specification multiple citations on well known methods of distance transformations on displayed images.

For example, as stated in paragraphs 5 and 6 of Applicant's specification:

"Distance transforms operating by propagation also known as "chamfer distance transforms" or "chamfer Euclidean distance transforms" deduce the distance of a pixel termed the goal pixel with respect to another pixel termed the source pixel, from the distances previously estimated for the pixels of its neighborhood, through a scan of the pixels of the image. The scan makes it possible to estimate the distance of a new goal pixel with respect to the source pixel by searching for the path of minimum length going from the new goal pixel to the source pixel passing through an intermediate pixel of its neighborhood whose distance has already been estimated, the distance of the new goal pixel to an intermediate pixel of its neighborhood whose distance has already been estimated being given by applying a neighborhood mask commonly called a chamfer mask.
A distance transform of this kind was proposed in 1986 by Gunilla Borgefors for estimating distances between objects in a digital image, in an article entitled: "Distance Transformation in Digital Images" and published in the journal "Computer Vision, Graphics and Image Processing", Vol. 34 pp. 344-378. One of the interesting benefits of these propagation-based distance transforms is of reducing the complexity of the calculations of a distance estimate by permitting the use of integers."

Further, paragraph 7 of the specification reads:

"To select the path of minimum length giving the distance estimate, a propagation-based distance transform must test all the possible paths. This obligation is manifested as a regularity constraint imposed on the order of scanning of the pixels of an image. G. Borgefors proposes, in order to satisfy this regularity constraint, that the pixels of an image be scanned twice consecutively, in two mutually inverse orders, which are either lexicographic order, the image being analyzed from left to right row by row and from top to bottom, and inverse lexicographic order, or transposed lexicographic order, the image having undergone a 90.degree. rotation, and inverse transposed lexicographic order.

She also proposes the adoption of a chamfer mask of dimensions 3.times.3 with two values (3, 4) of neighborhood distances or of dimensions 5.times.5 with three values (5, 7, 11) of neighborhood distances."

Paragraph 43, last line, affirms the above:

"G. Borgefors advocates a double scan of the pixels of the image, once in lexicographic order and another time in inverse lexicographic order."

The above citations can additionally be applied to claims 2, 3, and 6-11.

The specifiaction further adds,

"For terrain navigation of mobile objects such as robots, the propagation-based distance transform is used to estimate the distances of the points of the changing terrain map extracted from a database of elevation of the terrain with respect to the position of the mobile object or a close position. In this case, it is known to take account of static constraints consisting of map zones that the mobile object cannot cross on account of their undulating configurations."

The above citation from paragraph 0047 states that it is known in unmanned vehicles to use map data to constrain vehicle travel. However, this information is based upon static data.

Thus, it would be obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Ishihara with the teachings of Eppler to provide for a method of predicting the flight envelope of an aircraft based on the vehicle dynamic properties (position, altitude, etc). Doing so would provide for an improved method of predicted flight profile.

Regarding claims 2 and 3, Ishihara discloses a terrain awareness method in which one ground proximity warning system has been developed that generates terrain

caution and warning envelopes that extend forward of the aircraft based on the position and flight parameters of the aircraft. Terrain and obstacles that pierce the terrain caution and warning envelopes are displayed to the flight crew as potential ground proximity problems by appropriate alarms or warnings. Further, and importantly, the ground proximity warning system also generates terrain clearance floor envelopes that provide minimum altitudes that the aircraft should maintain above terrain underlying the aircraft. If the altitude of the aircraft with respect to the underlying terrain, is less than the minimum altitude required by the terrain clearance floor envelope, the ground proximity warning system will provide appropriate alerts.

Thus, all paths that do not meet with the altitude constraints of the vehicle are eliminated from the flight envelope, and a warning is issued.

Regarding claim 10, Ishihara, as modified by Eppler, combined with the well known work of Borgefors teaches the first four passes used in the scanning of the image pixels (see above), but does not explicitly state the next four image scanning methods.

However, it would have been obvious to a person of ordinary skill in the art to merge the previous four known methods into new combinations. Doing so would provide a propagation-based distance transform when scanning the pixels of the image constituted from the elements of the terrain elevation database corresponding to the map, in a series of eight passes that is repeated until a stabilization of the distance estimates is reached.

Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ishihara et al. (US 6,707,394), in view of Eppler (US 6,084,989) as applied to claims 2 and 3 above, and further in view of Feyereisen et al. (US 7,098,809).

Regarding claims 4 and 5, the combination of Ishihara and Eppler teaches a method of predicting the flight envelope of an aircraft, but does not explicitly teach displaying the forecasted deviations in altitude of the aircraft with respect to the ground as color strata.

Feyereisen, however, teaches a terrain awareness system in which the tactical terrain information is superimposed over monochromatic strategic terrain information, which is color coded in a graduated scale of a relative altitude color selected to indicate neutrality.

Thus, it would be obvious to one of ordinary skill in the art at the time to modify the combination (Ishihara, Eppler) with the teachings of Feyereisen to display the relative deviation to the ground in color. Doing so would provide an easily interpreted display system in which a threat level can easily be ascertained.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan M. Dager whose telephone number is 571-270-1332. The examiner can normally be reached on 0830-1800 (M-F).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JD

17 December 2007

SUPERVISORY PATENT EXAMINER